DOCUMENT RESUME

ED 106 723 95 CG 009 789

AUTHOR Weiner, Alan S.; Berzonsky, Michael D.
TITLE Development of Selective Attention in Reflective and Impulsive Children.
SPONS AGENCY National Inst. of Education (DHEW), Washington, D.C.
PUB DATE [75]
GRANT NE-G-00-3-0059
NOTE 22p.; Paper presented at the Annual Meeting of the American Educational Research Association (Washington, D.C., March 30-April 3, 1975)

EDRS PRICE MF-$0.76 HC-$1.58 PLUS POSTAGE
DESCRIPTORS *Attention Control; *Attention Span; *Children; Comparative Analysis; Elementary School Students; Individual Characteristics; *Learning Processes; Research Projects; *Response Mode
IDENTIFIERS *Matching Familiar Figures Test; MFF

ABSTRACT

Selective attention was assessed in second, fourth, and sixth grade reflective and impulsive children with an incidental learning task using pictures (animal-household object pairs) or shapes (colored forms) as stimuli. By the sixth grade, reflective children displayed less incidental learning and greater central learning than impulsive children when picture stimuli were used. Also, reflective children showed a trade-off of incidental for central learning but impulsive children did not appear to attend selectively. There were no differences between these children in selective attention when shape stimuli were used. It was concluded that reflective children are more flexible in their deployment of selective attention. The findings were discussed in terms of Hagen's two-stage model of selective attention. The possibility that impulsive children are not adept at utilizing feedback to determine relevant and irrelevant components was discussed. (Author)

ED106723

CG009789

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

Development of Selective Attention in Reflective and Impulsive Children[1, 2]

Alan S. Weiner

Michael D. Berzonsky

SUNY at Cortland

Paper presented at the 1975 American Educational Research Association Annual Meeting, Washington, D.C., 1975.

Development of Selective Attention in

Reflective and Impulsive Children

Conceptual tempo is a cognitive style which refers to how carefully a child evaluates his cognitive products before offering a response (Kagan, 1966). The child's tempo is usually judged by his performance on the Matching Familiar Figures Test (MFF) --a matching-to-sample task which requires the subject to choose among several response alternates. The reflective child takes longer to respond and makes fewer errors on the MFF than does the impulsive child. Conceptual tempo appears to be a stable dimension (Kagan & Kogan, 1970) which is related to other cognitive tasks such as word recognition (Kagan, 1965) and inductive reasoning (Kagan, Pearson & Welch, 1965). Because reflective children generally do better than impulsive children on these and other cognitive tasks, attempts have been made to modify impulsive responding.

The research which has examined the effect of models on conceptual tempo (Ridberg, Parke & Hetherington, 1971; Debus, 1970; Yando & Kagan, 1968) indicates that it is more difficult to modify errors than latency on the MFF. This suggests that by watching a model the impulsive subject can learn to slow down but not to effectively alter the strategy he uses on the MFF. Modifying tempo via modeling might be more effective if we had additional information on impulsive and reflective children regarding the processes which seem to be involved in observational learning. Bandura (1969) has argued that modeling involves the interaction of several subprocesses. The subprocess which is of major interest in this study is attention. It is possible that impulsive subjects are not attending to the complex series of acts performed by the models. Put differently, the subject would have to attend selectively; attend to certain relevant aspects of the model's behavior and ignore others (e.g. to pay more attention to the strategy used by the model than to the time taken by the model). In order to study differences in selective attention between impulsive and reflective children the present study employed an incidental learning paradigm.

Two contrasting predictions can be made about the incidental learning (IL) of impulsive and reflective children. Slower learners often attend to irrelevant stimuli (Stevenson, 1972). Therefore, because reflective children ordinarily outperform impulsive children on cognitive tasks, one might expect to find more IL and less central learning (CL) in impulsive children than reflective children. While reflective children are paying attention to central features of the task, impulsive children may be attending to irrelevant stimuli. A variety of developmental studies, however, have found IL to either increase or remain constant until 12-14 years of age, and then decline (Hagen, 1972; Hale, Miller & Stevenson, 1968; Siegel, 1968). Furthermore, there is a positive correlation between CL and IL at the younger ages and a negative correlation between these measures at later ages (Hagen, 1972; Druker & Hagen, 1969). Younger children who do well on CL also do well on IL, while older children who do well on CL ignore incidental stimuli. Thus, the increase in the ratio of CL to IL occurs primarily in early adolescence. These findings would lead to the prediction that at the young ages, reflective children will show more CL and IL than impulsive children and that the decline in IL will occur at an earlier age for reflective children than impulsive children.

A second aspect of the present study was concerned with the nature of the stimuli used and how this might interact with conceptual tempo. The above predictions were based on studies employing independent pictorial elements as the central and incidental stimuli (e.g. animals and household objects). However, Hale and Piper (1973), using stimuli which varied the degree of integration of the central and incidental components, found that IL increased even beyond age 12 when colored geometric shapes were used as stimuli. Thus, the pictures and the shapes were functionally different regarding developmental changes in IL and they argued that when the components of the stimulus are well-integrated, even older subjects who typically can attend selectively do not do so. The present study used animal-household object pairs and colored forms as stimuli to see if Hale

and Piper's findings would be replicated with reflective and impulsive children. Since there is some evidence that reflective children are better than impulsive children at visual analysis (Kagan, 1966), one might also expect the former children, rather than the latter, to show selectivity with the well-integrated shape stimuli.

A final, minor aspect of the study, varied the instructions presented to the subject to see if directing the child's attention to central and incidental features led to similar performance in reflective and impulsive children.

In summary, the purpose of the present investigation was threefold: (1) to attempt to examine the development of selective attention in children with either a reflective or impulsive conceptual tempo; (2) to determine whether the stimulus type--integrated (e.g., colored shapes) or independent (e.g. pictures of animals and household objects)--influences the developmental trends in selective attention found with impulsive and reflective children; and (3) to ascertain if similar performance results when reflective and impulsive children are told to attend to both components of the stimulus.

These goals were approached by employing an IL paradigm to examine the development of selective attention in reflective and impulsive children in grades two, four, and six. The stimulus arrays consisted of either pairs of pictures

of animals and household objects or colored shapes. Finally, half the subjects in each of the resulting subgroups were told to pay attention to the central and incidental stimuli while the other half were given the standard instructions which just directed their attention toward the central stimuli. This resulted in a 2 (Impulsive-Reflective) X 2 (Stimulus Type) X 2 (Instructions) X 3(Grade) design with the dependent measures being the subjects' CL and IL scores with picture or shape stimuli.

METHOD

Subjects

The MFF was administered to all second, fourth, and sixth grade children available for testing in a rural, central New York school district. Children who were above the median for their grade on mean MFF latency and below the median for their grade on total MFF errors were classified reflective. Those scoring below the median for their grade on mean MFF latency and above the median for their grade on total MFF errors were classified impulsive. The subjects were 30 impulsive and 32 reflective second graders; 36 impulsive and 36 reflective fourth graders; and 35 impulsive and 31 reflective sixth graders. The mean age, in months, for the second, fourth, and sixth graders was 97.35 (S.D. = 5.13), 123.21 (S.D. = 7.88), 147.95 (S.D. = 7.85), respectively.

Stimuli

In order to investigate the effect of stimulus type, two types of stimulus arrays--independent or integrated--were used. The independent type consisted of six white cards, each with a black outline drawing of an animal paired with a household object (Hagen, 1972). The integrated type also consisted of six cards, each with a different colored shape (e.g., red square, blue circle) (Hale & Piper, 1973). These cards were each 3" X 6" and all six were mounted in a horizontal array on a gray 8.5" X 30" panel.

Procedure

Each child was taken individually from the classroom and given the MFF. The MFF consisted of two practice items and 12 test items involving one standard familiar figure and six alternates. The subject was told to select the one of the six alternates which was identical to the standard. If the subject was incorrect he was allowed to continue until he was correct or made six incorrect choices. The number of errors and latency to first response were recorded on each item.

Reflective and impulsive subjects at each grade were designated to be tested on either Pictures or Shapes. Half of the subjects in these groups were told to remember the location of the central components and half were also told to remember which incidental component was paired with each central component. Within each grade and level of conceptual tempo, subjects in these four groups were matched, as closely as possible, on MFF errors and latencies.

The procedures used in measuring central and incidental learning were essentially the same as those used by Hale and Piper (1973).

Central Learning: There were 12 trials to assess central learning in which animal and shape were always the central components (household object and color were the incidental components). Each trial consisted of a presentation of the array of six cards. The array was presented for six seconds, then covered, and the subjects were shown a "cue card" of the central component (animal or outline drawing of the shape on a white card) of one of the six cards. The subject had to indicate on his answer sheet the location of that animal or shape on the array he had just seen. The array was briefly shown again (to provide feedback) and then the next array of the next trial was presented. The CL score was the number of trials on which the child correctly indicated the location of the cue card.

The same animals paired with the same objects (or the same shape of the same color) were used on all 12 trials. However, the position of each card in the array changed from trial to trial. The 12 trials were made of six different arrays, each shown twice. The order of presentation of the six arrays was randomly determined with the restriction that each array appear once in the first six and once in the last six trials. The placement of the stimulus cards on the array formed a Latin square with each card appearing twice in each of the six positions across the 12 trials. The cue card to be presented on each trial was randomly determined, but with two restrictions: (1) each cue appeared twice during the 12 trials; and, (2) no position on the array was correct less than once or more than three times.

Incidental Learning: This phase immediately followed the central learning phase. The subjects were shown an array of only the incidental stimuli; i.e. a horizontal row of six cards with drawings of the household objects or six cards which were entirely the color of the shapes. The subjects were then shown the central stimuli, one at a time, and had to indicate which object (or color) had been paired with the central stimulus being shown. The IL score was the number of pairs correctly identified.

Instructions: It was necessary that the children be tested in small groups. This was done by having them indicate their choice on an answer sheet. The answer sheet had a row of six small boxes for each question and it was explained to the subjects that these boxes corresponded to the position of the stimuli on the display panel. The first stimulus card on the panel had the number "1" written beneath it; the second stimulus had the number "2" written beneath it; etc. Likewise, the first box in each row on the answer sheet had a "1" beneath it; the second box had a "2" beneath it; etc. Two practice trials were given to explain the requirements of the task to the subjects and to instruct them on using the answer sheet. One investigator presented the stimuli and the other

was available to assist the subjects when necessary. Thus, instead of each subject having to point to the location of the stimulus card he thought correct, he merely indicated his choice by placing an "X" in the box on his answer sheet which corresponded to the position on the display panel of the stimulus which he thought was correct. There were no problems in using this procedure with children in grades 2, 4, and 6.

The practice array consisted of two stimuli, instead of six, which were similar to the kind of stimuli the subject would see. For example, the Picture group had practice trials involving animal-object pairs. All subjects were told to remember the location of the animals (shapes) because they would be asked to put an X in the box number where the cue card had been. Those subjects assigned to the Instruction group were also told to try to remember the household object paired with each animal (color of each shape); these Instructions were repeated after trial 6 of the central learning phase.

RESULTS

Separate 2 (Impulsive-Reflective) X 2 (Stimulus Type) X 2 (Instructions) X 3 (Grade) unequal n anovas were performed on the CL and IL scores. The only statistically significant effect in the CL analysis was due to Grade ($F = 4.5968$; $df = 2, 176$; $p < .05$). A Newman-Keuls analysis indicated that subjects in grades 4 ($\overline{X} = 5.194$) and 6 ($\overline{X} = 5.257$), while not differing from each other, had higher CL scores than subjects in grade 2 ($\overline{X} = 4.306$). The increase in CL with age agrees with Hale and Piper's (1973) findings.

The anova of IL scores indicated a highly significant effect due to Stimulus Type ($F = 19.3096$; $df = 1, 175$; $p < .01$) with IL being greater with Shapes ($\overline{X} = 3.443$) than with Pictures ($\overline{X} = 2.363$). Because the type of stimulus had such a strong influence on IL and because this variable tended to interact with several other variables ($p < .10$) which were of interest, separate 2 (Impulsive-Reflective) X 2 (Instructions) X 3 (Grade)

unequal n anovas were performed on the IL Picture scores and on the IL Shape scores.

The only significant effect in the analysis of the Picture data was a Tempo X Grade interaction ($F = 4.009$; $df = 2, 90$; $p < .05$). The means for this interaction are presented in Table 1. IL with Pictures appears to increase with age for impulsive subjects but an analysis of simple effects indicated that this increase was nonsignificant ($F = 1.618$; $df = 2, 90$; n.s.). IL tended to decline with age in reflective children ($F = 2.433$; $df = 2, 90$; $.05 < p < .10$). Further analysis showed that in grade 6, when a decline in IL can be expected, there was significantly greater IL in impulsive than reflective children ($t_{90} = 2.887$; $p < .01$). Thus, the instructions used in this study had little effect on CL or IL with Pictures and, as predicted, selective attention appears to develop sooner in reflective than impulsive children. The prediction that, at the younger ages, IL would be greater in reflective than impulsive subjects was not substantiated, although the mean scores for second graders were in the predicted direction.

Insert Table 1 Here

The analysis of the Shape data indicated that subjects who were instructed to remember the colors of the forms had higher IL scores ($\bar{X} = 3.933$) than subjects not given these instructions ($\bar{X} = 2.927$) ($F = 6.788$; $df = 2, 85$; $p < .05$). As in Hale and Piper's (1973) second experiment, IL with these Shape stimuli tended to increase with age ($F = 2.517$; $df = 2, 85$; $.05 < p < .10$). However, this was primarily due to the performance of subjects given instructions to remember the incidental components ($F = 2.782$; $df = 2, 85$; $.05 < p < .10$). Thus Hale and Piper's assertion that, regarding IL, Shape and Picture stimuli are functionally different was supported by the differential effect of instructions with these stimuli. Of special interest for the present study was that the functional distinction between these stimuli was only apparent for reflective children. This assertion is supported by the correlations between CL and IL for reflective and impulsive children

in grades two, four, and six. These correlations, which provide information about the tradeoff of IL for CL, are presented in Table 2 with the Instruction conditions having been combined.

Insert Table 2 Here

By grade 6 the performance of both reflective and impulsive children with Shape stimuli showed a significant positive relation between CL and recall of incidental stimuli. These findings agree with those reported by Hale and Piper (1973). Impulsive sixth graders displayed a similar, significant positive relation between CL and IL with Picture Stimuli, suggesting they used a similar strategy with both stimuli. The negative correlation between CL and IL with Pictures for Grade 6 reflectives suggests that these children have begun to show the tradeoff of IL for CL and that the strategy they use depends on the type of stimuli presented. However, if such a tradeoff occurred, then CL with Pictures should be greater for sixth-grade reflectives than sixth-grade impulsives. A closer scrutiny of the CL Tempo X Stimulus Type X Instruction X Grade interaction ($F = 2.752$; $df = 2, 176$; $.05 < p < .10$) supports this expectation. The CL Picture scores are presented in Table 3. These data indicate no reflective-impulsive differences in the developmental trends for CL when subjects were given instructions to remember both central and incidental components. For subjects given standard instructions, a Newman-Keuls analysis indicates that CL for grade 6 reflectives differed significantly from that of grade 6 impulsives, and from second grade impulsives and reflectives.

Insert Table 3 Here

The data seems to clearly indicate that reflective sixth graders can attend selectively and thereby enhance CL and that the attentional strategy they choose varies with the nature of the stimuli. The data for impulsives are more perplexing. The impression these subjects give with Picture stimuli is that of a tendency toward an increase in IL and a decline in CL with age; yet their CL and IL scores are positively

correlated. This is not the result of having collapsed on Instruction conditions in Table 2, since correlations for impulsive subjects without Instructions ($r = .63$; $n = 9$) and with Instructions ($r = .54$; $n = 9$) present the same picture. It is as if these children are struggling with a strategy they cannot effectively use.

DISCUSSION

The findings for CL in this study are quite similar to those of other studies which generally report CL to increase with age (Hagen, 1972). Also, the present findings replicate Hale and Piper's (1973) work by indicating that the relation between CL and age does not interact with type of stimulus--at least within the range of stimuli used. Although CL increased with both types of stimuli, Hale and Piper's findings for IL indicated that these stimuli were functionally different. The present findings also suggest this. Incidental learning tended to increase with age for Shape but not for Picture stimuli; especially for those subjects who were instructed to remember the shape and color of the stimuli. The instructions used in this study had no effect on performance with Pictures. Perhaps the most interesting finding of this study is that a functional distinction between these stimuli appears to be related to the child's conceptual tempo.

Reflective and impulsive children performed similarly with Shape stimuli. There was no tendency for tempo to effect either CL or IL. Furthermore, by the sixth grade both types of subjects displayed a significant, positive correlation between CL and IL with Shapes. This correlation is similar to that found by Hale and Piper (1973) and supports their contention that with Shapes the central and incidental components are integral parts of the whole stimulus and that it is not necessary to adopt a selective strategy.

Thus, at the age when strategies to attend selectively seem to appear (Hagen, 1972), subjects choose not to attend selectively to the Shape stimuli because it is not advantageous to do so. This may be a decision though, which is made more by reflective than impulsive children.

The findings with Picture stimuli, which consisted of independent central and incidental components, were related to the child's conceptual tempo. Performance with these stimuli is enhanced when the subject employs a selective strategy. Incidental learning declined with age for reflective children and, at the sixth grade level, reflective subjects displayed significantly less IL than impulsive subjects. This, along with the sixth grade reflective child's high CL score in the standard instruction condition and the trend toward a negative CL-IL correlation for these subjects suggests that they are attending selectively and showing a trade-off of IL for CL. Thus, reflective children, at least by the time they reach the sixth grade, are flexible in their deployment of attention in that they used a selective strategy which enhanced performance with Pictures but did not use this strategy since it would not facilitate performance with Shapes.

The positive CL-IL correlations were significant with both Shapes and Pictures for sixth grade impulsive children, implying they used the same strategy for both types of stimuli. One possible interpretation is that impulsive children are merely displaying a delay in the onset of selective attention and that somewhat older impulsive youngsters would perform like the sixth grade reflectives. This interpretation could be related to cross cultural research showing that environmental factors can delay the onset of selective attention (Wagner, 1974). However, this interpretation seems to be inconsistent with some aspects of the impulsive child's performance. More specifically, it could not explain the positive IL-CL correlation with Pictures coupled with the trend toward an increase in IL and a decline in CL for these subjects. Another interpretation is that sixth grade impulsive children recognize the need for a selective strategy with Picture stimuli but cannot effectively utilize this strategy.

Hagen (Hagen, 1972) has suggested a two-stage model of selective attention. The first stage is one of discrimination where the subject identifies both the relevant and incidental cues. The second stage involves focusing on the relevant features and ignoring the incidental cues. Impulsive children may have trouble attending selectively because of problems in stage I related to difficulty in distinguishing relevant from irrelevant cues. This could result in their trying to remember all cues because they are not efficient in determining which cues are most important. This strategy would impair CL and would also account for the positive CL-IL correlation with Pictures. Reflective children seem to carry out both stages with flexibility and efficiency. They appear to discriminate relevant from irrelevant cues and then attend selectively if the task demands (Picture or Shape) indicate that this would be an effective strategy.

The suggested difficulties which impulsive children have in stage I of selective attention can be traced to at least two possible sources. First, at a very general level, impulsive children may have difficulty breaking a stimulus configuration into its components. Zelniker and Oppenheimer (1973) pointed out that impulsive children do poorly on discrimination problems and profit from training in stimulus differentiation. Their suggestion that impulsive children may do better when required to perceive wholes rather than details is consistent with some of the original research on conceptual tempo which indicates that impulsive children are less analytic than reflective children (Kagan, Moss, & Sigel, 1963).

Second, impulsive children may do poorly in stage I because of difficulties in determining which stimulus component is relevant. Neussle (1972) found that reflective children are better able than impulsive ones to utilize feedback, especially feedback indicating they were incorrect, to review their previous responses and generate a hypothesis consistent with the feedback. McKinney (1973) also concluded that reflective children are more efficient hypothesis testers and that impulsive children are more likely to use infor-

mation in a nonsystematic, trial-and-error way. This interpretation is also consistent with previous suggestions that impulsives may have had inconsistent reinforcement histories (Weiner & Adams, 1974) which interfered with their learning to use feedback systematically.

This interpretation could be tested more clearly by testing reflective and impulsive children beyond grade 6 and by varying the difficulty of the task; i.e. by manipulating the difficulty of the initial discriminations. Such a task should highlight differences between reflective and impulsive children since previous research has shown that impulsive children revert to their old strategies when tasks become more difficult (Egeland, 1974), and that the differences between reflective and impulsive children are most apparent on difficult items or following negative feedback (Neussle, 1972).

In conclusion, the position taken here is that impulsive and reflective children may have similar strategies available to them and that the former children may not have to be taught new strategies, but to plan to effectively use the ones they already have.

Footnotes

1. The project reported herein was performed pursuant to grant No. NEG-00-3-0059 to the first author from the National Institute of Education, Department of Health, Education and Welfare. However, the opinions expressed herein do not necessarily reflect the position or policy of the National Institute of Education, and no official endorsement by the National Institute of Education should be inferred.
2. The authors wish to acknowledge the assistance and cooperation provided by Mrs. Host and Mr. Aldrich, principals, and the teachers and students of the Lafayette, New York Elementary and Middle Schools. Thanks are also extended to Gale Weiner, who prepared the stimuli, and to Joyce Cliff, who assisted in collecting and analyzing the data. Requests for reprints should be sent to the first author, at the Department of Psychology.

References

Adams, W.V. Strategy differences between reflective and impulsive children. Child Development, 1972, 43(3), 1076-1081

Bandura, A. Social-learning theory of identificatory processes. In D. Goslin (Ed.), Handbook of socialization theory and research. Chicago: Rand McNally, 1969.

Debus, R. Effects of brief observation of model behavior on conceptual tempo of impulsive children. Developmental Psychology, 1970, 2(1), 22-32.

Druker, J. & Hagen, J. Developmental trends in the processing of task-relevant and task-irrelevant information. Child Development, 1969, 40(2), 371-382.

Egeland, B. Training impulsive children in the use of more efficient scanning techniques. Child Development, 1974, 45(1), 165-171.

Hagen, J.W. Strategies for remembering. In S. Farnham-Diggory (Ed.), Information processing in children. New York: Academic Press, 1972.

Hale, G., Miller, L., & Stevenson, H. Incidental learning of film content: A developmental study. Child Development, 1968, 39(1), 69-77.

Hale, G. & Piper, R. Developmental trends in children's incidental learning: Some critical stimulus differences. Developmental Psychology, 1973, 8(3), 327-335.

Kagan, J. Reflection-impulsivity and reading ability in primary grade children. Child Development, 1965, 36, 609-628.

Kagan, J. Developmental studies in reflection and analysis. In A. Kidd and J. Rivoire (Eds.), Perceptual development in children. New York: International Universities Press, 1966.

Kagan, J., & Kogan, N. Individuality and cognitive performance. In P. Mussen (Ed.), Carmichael's manual of child psychology. (3rd ed.). Vol. 1. New York: John Wiley, 1970.

Kagan, J., Moss., H., & Sigel, I. Psychological significance of styles of conceptualization. In J. Wright and J. Kagan (Eds.), Basic cognitive processes in children. Monographs of the Society for Research in Child Development, 1963, 28 (2, Serial No. 86), 73-124.

Kagan, J., Pearson, L., & Welch, L. Conceptual impulsivity and inductive reasoning. Child Development, 1966, 37, 583-594.

McKinney, J.D. Problem solving strategies in impulsive and reflective second graders. Developmental Psychology, 1973, 8(1), 145.

Neussle, W. Reflectivity as an influence on focusing behavior of children. Journal of Experimental Child Psychology, 1972, 14, 265-276.

Odom, R., McIntyre, C., & Neale, G. The influence of cognitive style on perceptual learning, Child Development, 1971, 42(3), 883-893.

Ridberg, E., Parke, R., & Hetherington, E. Modification of impulsive and reflective cognitive styles through observation of film-mediated models. Developmental Psychology, 1971, 5, 369-377.

Schack, M., & Massari, D. The effect of conceptual tempo and reinforcement conditions on probability learning. Paper presented at the meeting of the Society for Research in Child Development, Minneapolis, 1971.

Siegel, A. Variables affecting incidental learning in children. Child Development, 1968, 39, 957-968.

Stevenson, H. Children's learning. New York: Appleton Century Crofts, 1972.

Wagner, D. The development of short-term and incidental memory: A cross-cultural study. Child Development, 1974, 45, 389-396.

Weiner, A., & Adams, W. The effect of failure and frustration on reflective and impulsive children. Journal of Experimental Child Psychology, 1974, 17(2), 353-359.

Welch, L. A naturalistic study of the free play behavior of reflective and impulsive four-year-olds. Paper presented at the Society for Research in Child Development, Philadelphia, 1973.

Yando, R., & Kagan, J. The effect of teacher tempo on the child. Child Development, 1968, 39(1), 27-34.

Zelniker, T. & Oppenheimer, L. Modification of information processing of impulsive children. Child Development, 1973, 44, 445-450.

Table 1

Mean Incidental Learning Score with Picture Stimuli for Reflective and Impulsive Subjects in Grades 2, 4, and 6

Tempo	GRADE		
	2	4	6
Impulsive	2.134 (15)[a]	2.334 (18)	3.056 (18)
Reflective	2.563 (16)	2.495 (19)	1.5 (16)

a. Cell N is presented in parentheses

Table 2

Correlations Between Central and Incidental Learning for Impulsive and Reflective Children in Grades 2, 4 and 6

GRADE	Impulsive Subjects	Reflective Subjects
	Picture Stimuli	
2	.009 (15)[a]	.114 (16)
4	-.188 (18)	-.033 (19)
6	.642 (18)[b]	-.352 (16)
	Shape Stimuli	
2	-.353 (15)	.004 (16)
4	.074 (18)	.023 (17)
6	.547 (16)[b]	.569 (15)[b]

[a]Numbers in brackets refer to N

[b]$p < .05$

Table 3

Mean Central Learning Scores Using Picture Stimuli

TEMPO	INSTRUCTION CONDITION	GRADE 2	4	6
IMPULSIVE	WITHOUT	3.857 (7)[a]	5.889 (9)	3.888 (9)
	WITH	4.625 (8)	4.333 (9)	5.333 (9)
REFLECTIVE	WITHOUT	3.750 (8)	5.600 (10)	7.00 (8)
	WITH	4.25 (8)	4.889 (9)	5.125 (8)

a. Cell N is presented in parentheses